

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

--	--	--	--	--	--	--	--	--	--

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

EEM2046 – ENGINEERING MATHEMATICS IV
(RE / TE)

3 JUNE 2016
3.00 p.m. – 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of five pages including cover page with four questions only.
2. Attempt all **FOUR** questions. The distribution of the marks for each question is given.
3. Please write down all your answers in the answer Booklet provided. Show all relevant steps to obtain maximum marks.

Question 1 (30marks)

- a) Evaluate $\int_C \frac{e^{2z} - e + 1}{z - 0.5} dz$ where contour C is the unit circle centred at the origin using Cauchy's Integral Formula.

[4m]

- b) Given the complex function $f(z) = \frac{1}{z - 5}$. Find the Laurent series valid for

- i) $|z| < 5$
- ii) $|z| > 5$
- iii) $|z - 1| < 4$

Leave your answer in sigma notation.

[Hint: $\frac{1}{1 - z} = \sum_{n=0}^{\infty} z^n$, for $|z| < 1$.]

[4m+4m+4m]

- c) Evaluate $\int_{-\infty}^{\infty} \frac{1}{(x^2 + 1)(x^2 + 2)} dx$ by using Residue Theorem. Leave the final answer in 2 decimal places.

[14m]

Continued...

Question 2 (30 marks)

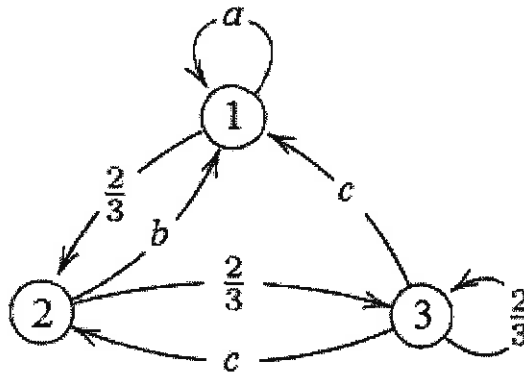
- a) Let X_1 and X_2 be two continuous random variables with joint probability distribution function (pdf)

$$f_{X_1, X_2}(x_1, x_2) = \begin{cases} cx_1x_2, & 0 < x_1 < 1; 0 < x_2 < 1 \\ 0, & \text{elsewhere} \end{cases}$$

- i) Find the constant c .
- ii) Find the joint pdf of $Y_1 = X_1 + X_2$ and $Y_2 = X_2$.

[5m+10m]

- b) Consider the discrete time Markov chain with state space $\{1, 2, 3\}$



- i) Find a , b and c .
- ii) Write down the one step transition probability matrix, P .
- iii) Decompose the state space into equivalent classes. Determine whether each class is recurrent or transient.
- iv) Is the Markov chain irreducible? Explain why.
- v) Find the periodicity of state 1.
- vi) Suppose that the Markov chain has initial state probabilities that are equally likely. Find the state probabilities after one transition.

[3m+3m+2m+2m+2m+3m]

Continued...

Question 3 (20 marks)

a) You are provided with the Linear Programming (LP) model as below

$$\text{Maximise } z = x_1 + 2x_2$$

$$\text{Subject to: } 2x_1 + x_2 \leq 1$$

$$x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

- i) Convert the LP model into its standard form.
- ii) Find the dual of the LP model.

[4m+5m]

b) The tableau for a maximisation Linear Programming problem at Iteration 0 is as given below. Use Simplex Iteration Method to find the optimal value and optimal solution.

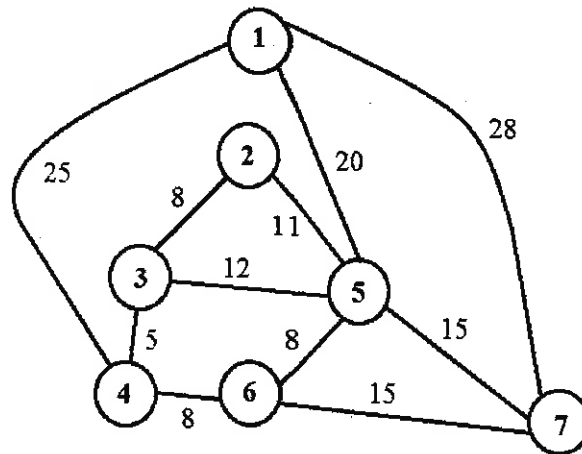
Basic	z	x_1	x_2	s_1	s_2	s_3	Solution
z	1	-2	-3	0	0	0	0
s_1	0	3	1	1	0	0	3
s_2	0	1	1	0	1	0	2
s_3	0	0	2	0	0	1	6

[11m]

Continued...

Question 4 (20 marks)

Consider the following graph.



- Apply Kruskal's algorithm to find the minimal spanning tree. Write down your steps in detail. Draw the minimal spanning tree.
- By using the concept of minimal spanning in part a), repeat to find maximal spanning tree. Write down your steps in detail. Draw the maximal spanning tree.

[14m+6m]

End of Paper